

SEQUENCE LISTING

<110> BASF Plant Science GmbH

<120> Delta-4-Desaturases from Euglena gracilis, expressing
plants and PUFA comprising oils

<130> 20030192

<160> 2

<170> PatentIn version 3.1

<210> 1

<211> 1626

<212> DNA

<213> Euglena gracilis

<220>

<221> CDS

<222> (1)..(1623)

<223> Delta-4-Desaturase

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aac ggc aag ccg gag aac gga gcc acc cct gag aac gga gcg aag ccg	96
Asn Gly Lys Pro Glu Asn Gly Ala Thr Pro Glu Asn Gly Ala Lys Pro	
20 25 30	
caa cct tgc gag aac ggc acg gtg gaa aag cga gag aat gac acc gcc	144
Gln Pro Cys Glu Asn Gly Thr Val Glu Lys Arg Glu Asn Asp Thr Ala	
35 40 45	
aac gtt cgg ccc acc cgt cca gct gga ccc ccg ccg gcc acg tac tac	192
Asn Val Arg Pro Thr Arg Pro Ala Gly Pro Pro Pro Ala Thr Tyr Tyr	
50 55 60	
gac tcc ctg gca gtg tcg ggg cag ggc aag gag cgg ctg ttc acc acc	240
Asp Ser Leu Ala Val Ser Gly Gln Gly Lys Glu Arg Leu Phe Thr Thr	

65	70	75	80	
gat gag gtg agg cgg cac atc ctc ccc acc gat ggc tgg ctg acg tgc				288
Asp Glu Val Arg Arg His Ile Leu Pro Thr Asp Gly Trp Leu Thr Cys	85	90	95	
cac gaa gga gtc tac gat gtc act gat ttc ctt gcc aag cac cct ggt				336
His Glu Gly Val Tyr Asp Val Thr Asp Phe Leu Ala Lys His Pro Gly	100	105	110	
ggc ggt gtc atc acg ctg ggc ctt gga agg gac tgc aca atc ctc atc				384
Gly Gly Val Ile Thr Leu Gly Leu Gly Arg Asp Cys Thr Ile Leu Ile	115	120	125	
gag tca tac cac cct gct ggg cgc ccg gac aag gtg atg gag aag tac				432
Glu Ser Tyr His Pro Ala Gly Arg Pro Asp Lys Val Met Glu Lys Tyr	130	135	140	
cgc att ggt acg ctg cag gac ccc aag acg ttc tat gct tgg gga gag				480
Arg Ile Gly Thr Leu Gln Asp Pro Lys Thr Phe Tyr Ala Trp Gly Glu	145	150	155	160
tcc gat ttc tac cct gag ttg aag cgc cgg gcc ctt gca agg ctg aag				528
Ser Asp Phe Tyr Pro Glu Leu Lys Arg Arg Ala Leu Ala Arg Leu Lys	165	170	175	
gag gct ggt cag gcg cgg cgc ggc ggc ctt ggg gtg aag gcc ctc ctg				576
Glu Ala Gly Gln Ala Arg Arg Gly Gly Leu Gly Val Lys Ala Leu Leu	180	185	190	
gtg ctc acc ctc ttc ttc gtg tcg tgg tac atg tgg gtg gcc cac aag				624
Val Leu Thr Leu Phe Phe Val Ser Trp Tyr Met Trp Val Ala His Lys	195	200	205	
tcc ttc ctc tgg gcc gcc gtc tgg ggc ttc gcc ggc tcc cac gtc ggg				672
Ser Phe Leu Trp Ala Ala Val Trp Gly Phe Ala Gly Ser His Val Gly	210	215	220	
ctg agc atc cag cac gat ggc aac cac ggc gcg ttc agc cgc aac aca				720
Leu Ser Ile Gln His Asp Gly Asn His Gly Ala Phe Ser Arg Asn Thr	225	230	235	240
ctg gtg aac cgc ctg gcg ggg tgg ggc atg gac ttg atc ggc gcg tcg				768
Leu Val Asn Arg Leu Ala Gly Trp Gly Met Asp Leu Ile Gly Ala Ser	245	250	255	
tcc acg gtg tgg gag tac cag cac gtc atc ggc cac cac cag tac acc				816
Ser Thr Val Trp Glu Tyr Gln His Val Ile Gly His His Gln Tyr Thr	260	265	270	
aac ctc gtg tcg gac acg cta ttc agt ctg cct gag aac gat ccg gac				864
Asn Leu Val Ser Asp Thr Leu Phe Ser Leu Pro Glu Asn Asp Pro Asp	275	280	285	

3

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Val Phe Ser Ser Tyr Pro Leu Met Arg Met His Pro Asp Thr Ala Trp	
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cag ccg cac cac cgc ttc cag cac ctg ttc gcg ttc cca ctg ttc gcc	960
Gln Pro His His Arg Phe Gln His Leu Phe Ala Phe Pro Leu Phe Ala	
305 310 315 320	
ctg atg aca atc agc aag gtg ctg acc agc gat ttc gct gtc tgc ctc	1008
Leu Met Thr Ile Ser Lys Val Leu Thr Ser Asp Phe Ala Val Cys Leu	
325 330 335	
agc atg aag aag ggg tcc atc gac tgc tcc tcc agg ctc gtc cca ctg	1056
Ser Met Lys Lys Gly Ser Ile Asp Cys Ser Ser Arg Leu Val Pro Leu	
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Glu Gly Gln Leu Leu Phe Trp Gly Ala Lys Leu Ala Asn Phe Leu Leu	
355 360 365	
cag att gtg ttg cca tgc tac ctc cac ggg aca gct atg ggc ctg gcc	1152
Gln Ile Val Leu Pro Cys Tyr Leu His Gly Thr Ala Met Gly Leu Ala	
370 375 380	
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Leu Phe Ser Val Ala His Leu Val Ser Gly Glu Tyr Leu Ala Ile Cys	
385 390 395 400	
ttc atc atc aac cac atc agc gag tct tgt gag ttt atg aat aca agc	1248
Phe Ile Ile Asn His Ile Ser Glu Ser Cys Glu Phe Met Asn Thr Ser	
405 410 415	
ttt caa acc gcc gcc cgg agg aca gag atg ctt cag gca gca cat cag	1296
Phe Gln Thr Ala Ala Arg Arg Thr Glu Met Leu Gln Ala Ala His Gln	
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gca gcg gag gcc aag aag gtg aag ccc acc cct cca ccg aac gat tgg	1344
Ala Ala Glu Ala Lys Lys Val Lys Pro Thr Pro Pro Pro Asn Asp Trp	
435 440 445	
gct gtg aca cag gtc caa tgc tgc gtg aat tgg aga tca ggt ggc gtg	1392
Ala Val Thr Gln Val Gln Cys Cys Val Asn Trp Arg Ser Gly Gly Val	
450 455 460	
ttg gcc aat cac ctc tct gga ggc ttg aac cac cag atc gag cat cat	1440
Leu Ala Asn His Leu Ser Gly Gly Leu Asn His Gln Ile Glu His His	
465 470 475 480	
ctg ttc ccc agc atc tgc cat gcc aac tac ccc acc atc gcc cct gtt	1488
Leu Phe Pro Ser Ile Ser His Ala Asn Tyr Pro Thr Ile Ala Pro Val	
485 490 495	
gtg aag gag gtg tgc gag gag tac ggg ttg ccg tac aag aat tac gtc	1536
Val Lys Glu Val Cys Glu Glu Tyr Gly Leu Pro Tyr Lys Asn Tyr Val	

500	505	510	
acg ttc tgg gat gca gtc tgt ggc atg gtt cag cac ctc cgg ttg atg			1584
Thr Phe Trp Asp Ala Val Cys Gly Met Val Gln His Leu Arg Leu Met			
515	520	525	
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Gly Ala Pro Pro Val Pro Thr Asn Gly Asp Lys Lys Ser			
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Gln Pro Cys Glu Asn Gly Thr Val Glu Lys Arg Glu Asn Asp Thr Ala			
35	40	45	
Asn Val Arg Pro Thr Arg Pro Ala Gly Pro Pro Pro Ala Thr Tyr Tyr			
50	55	60	
Asp Ser Leu Ala Val Ser Gly Gln Gly Lys Glu Arg Leu Phe Thr Thr			
65	70	75	80
Asp Glu Val Arg Arg His Ile Leu Pro Thr Asp Gly Trp Leu Thr Cys			
85	90	95	
His Glu Gly Val Tyr Asp Val Thr Asp Phe Leu Ala Lys His Pro Gly			
100	105	110	
Gly Gly Val Ile Thr Leu Gly Leu Gly Arg Asp Cys Thr Ile Leu Ile			
115	120	125	

Glu Ser Tyr His Pro Ala Gly Arg Pro Asp Lys Val Met Glu Lys Tyr
 130 135 140

Arg Ile Gly Thr Leu Gln Asp Pro Lys Thr Phe Tyr Ala Trp Gly Glu
 145 150 155 160

Ser Asp Phe Tyr Pro Glu Leu Lys Arg Arg Ala Leu Ala Arg Leu Lys
 165 170 175

Glu Ala Gly Gln Ala Arg Arg Gly Gly Leu Gly Val Lys Ala Leu Leu
 180 185 190

Val Leu Thr Leu Phe Phe Val Ser Trp Tyr Met Trp Val Ala His Lys
 195 200 205

Ser Phe Leu Trp Ala Ala Val Trp Gly Phe Ala Gly Ser His Val Gly
 210 215 220

Leu Ser Ile Gln His Asp Gly Asn His Gly Ala Phe Ser Arg Asn Thr
 225 230 235 240

Leu Val Asn Arg Leu Ala Gly Trp Gly Met Asp Leu Ile Gly Ala Ser
 245 250 255

Ser Thr Val Trp Glu Tyr Gln His Val Ile Gly His His Gln Tyr Thr
 260 265 270

Asn Leu Val Ser Asp Thr Leu Phe Ser Leu Pro Glu Asn Asp Pro Asp
 275 280 285

Val Phe Ser Ser Tyr Pro Leu Met Arg Met His Pro Asp Thr Ala Trp
 290 295 300

Gln Pro His His Arg Phe Gln His Leu Phe Ala Phe Pro Leu Phe Ala
 305 310 315 320

Leu Met Thr Ile Ser Lys Val Leu Thr Ser Asp Phe Ala Val Cys Leu
 325 330 335

Ser Met Lys Lys Gly Ser Ile Asp Cys Ser Ser Arg Leu Val Pro Leu

340

345

350

Glu Gly Gln Leu Leu Phe Trp Gly Ala Lys Leu Ala Asn Phe Leu Leu
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Gln Ile Val Leu Pro Cys Tyr Leu His Gly Thr Ala Met Gly Leu Ala
 370 375 380

Leu Phe Ser Val Ala His Leu Val Ser Gly Glu Tyr Leu Ala Ile Cys
 385 390 395 400

Phe Ile Ile Asn His Ile Ser Glu Ser Cys Glu Phe Met Asn Thr Ser
 405 410 415

Phe Gln Thr Ala Ala Arg Arg Thr Glu Met Leu Gln Ala Ala His Gln
 420 425 430

Ala Ala Glu Ala Lys Lys Val Lys Pro Thr Pro Pro Pro Asn Asp Trp
 435 440 445

Ala Val Thr Gln Val Gln Cys Cys Val Asn Trp Arg Ser Gly Gly Val
 450 455 460

Leu Ala Asn His Leu Ser Gly Gly Leu Asn His Gln Ile Glu His His
 465 470 475 480

Leu Phe Pro Ser Ile Ser His Ala Asn Tyr Pro Thr Ile Ala Pro Val
 485 490 495

Val Lys Glu Val Cys Glu Glu Tyr Gly Leu Pro Tyr Lys Asn Tyr Val
 500 505 510

Thr Phe Trp Asp Ala Val Cys Gly Met Val Gln His Leu Arg Leu Met
 515 520 525

Gly Ala Pro Pro Val Pro Thr Asn Gly Asp Lys Lys Ser
 530 535 540